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A Report of the Soil Conservation Service to the Secretary
of Agriculture on Problems of the Southern Great Plains and
a Conservation Program for the Region. April, 1954.

DROUGHT AND WIND EROSION PROBLEMS
OF THE SOUTHERN GREAT PLAINS

The severe drought of the last few years has again emphasized the need for land use adjustments and changes in farming practices that will permit a permanent and stable agriculture in the Southern Great Plains.

Recurring drought is a normal feature of the Southern Great Plains--an area of about 200,000 square miles in eastern Colorado, western Kansas, eastern New Mexico, western Oklahoma, and western Texas. Extended droughts, interspersed with wet periods, have been coming to this region ever since it was settled. Reliable information indicates that droughts have been a common feature of the region for centuries. There is no reason to assume that the present drought is an unusual situation; nor is there any reason to assume that severe droughts will not come again.

This is the fourth time since this region was first settled, in the 1880's, that drought has been so severe and persistent as to cause great hardships for most of the people and damage to some of the land.^{1/} Each of the 3 previous long droughts forced radical, temporary changes in land use. Two of these droughts (1890-95 and 1931-38) caused widespread depopulation of some areas. That of the 1930's brought on such regional wide wind erosion and dust storms that it was termed a major disaster.

But the wet periods that followed each major drought brought new settlers to the region. These wet periods also encouraged farmers and ranchers, especially the newcomers, to resume the same types of land use that had proved so inadequate during each long drought. In other words, during the wet periods, the people of this region have consistently adopted land use practices that were suitable only for periods of above normal rainfall. As a result, it has been impossible for them to maintain a profitable and stable agriculture during long drought periods.

^{1/} See the appendix to this report for more complete history of drought and land use in this region.

The Current Drought

The present drought started in many section of the southern Plains in the summer and fall of 1950. Below normal rainfall came to most areas in 1951. Severe drought was the rule in nearly all sections throughout 1952. In several areas the situation was critical by the fall of 1952.

Soil blowing was severe in the sandy land cotton country of west central Texas and eastern New Mexico in the spring of 1953. But blowing was not severe except on occasional fields in other sections of the region. Drought continued, however, over practically all the region throughout 1953, except for some fairly good fall rains. These fall rains were, in most localities, sufficient to get the winter wheat crop off to a fair start. Then drought really closed down.

Weather Bureau records show that, for the 16 weeks ending April 5, 1954, this region (with a few local exceptions) received less than 1 inch of precipitation. In some localities, less than .1 inch fell during this 4 month period.

As often happens, the severe winter drought was accompanied by above normal temperatures. This tended to increase the persistency and velocity of the spring winds that are common to the region. On February 19, 1954 one of the most severe wind storms ever to occur on the southern Plains developed in Greely and Hamilton counties, Kansas. According to wind gages at Dodge City, Kansas, the velocity of the wind was about 49 miles per hour for 6 successive hours and gusts reached 80 or 90 miles per hour. No accurate measurements are available, but the wind was probably stronger 100 miles west at the center of the storm.

This one storm did irreparable damage to much of the growing wheat and seriously damaged stubble cover in southwestern Kansas and southeastern Colorado. High winds continued throughout the region during the remainder of February and March. Soil blowing spread from field to field. By April 1 the situation was critical in large areas.

Area Damaged, as of April 1, 1954

By April 1, 1954 wind erosion had become a serious problem in southeastern Colorado, western Kansas, southwestern Nebraska, eastern New Mexico, western Oklahoma, and western Texas. (See map).

About 30 percent of the cropland and 10 percent of the range-land in this area had been damaged by wind erosion. The total amount of cropland damaged, as of April 1, 1954, was about 11,650,000 acres.

Rangeland damage amounted to about 5,210,000 acres. In addition, there were about 8,170,000 acres of cropland and 6,660,000 acres of rangeland that are liable to be damaged this spring unless effective rains come soon. (Table 1 shows land damage by States).

Damage to Croplands

There are two principal kinds of land damage: soil removal and deposition of eroded material. Soil removal accounts for the principal damage on 75 percent or more of the 11,650,000 acres of cropland; deposition is the principal damage on the remainder.

A major part of the soil blowing started on sandy or shallow soils or other poor lands where short crops or crop failures occurred for the last three or four years. Even where some conservation measures were used these poor lands were in a "condition to blow" because the lack of crops had resulted in all residues being exhausted. Thus there was little or no soil cover.

Soil blowing frequently spread from some of the poor or mismanaged lands to nearby fields that had adequate cover. These fields with good cover were first damaged mainly by depositions. But the deposits of silt or sand usually started blowing with the next wind storm and in some cases the blowing on such fields extended down into the original soil.

Soil blowing started on some land that is well suited for cultivation; but, except for parts of southwestern Kansas and southeastern Colorado, it was due mainly to poor farming practices that left the ground surface bare of cover, or to overgrazing of growing wheat or sorghum stubble.

As stated, the center of the severe storm of February 19 was in Hamilton and Greely counties, Kansas. As a result, some lands of southwestern Kansas and southeastern Colorado that were presumed to be adequately protected started blowing and have continued to blow. Many terrace channels and irrigation ditches have been filled with silt or sand in this area.

Where good conservation measures, such as stubble mulch tillage, were practiced on the better hardlands of the region there has been little soil blowing, to date. For example, there has not been much severe soil blowing on the good wheatlands of the Texas and Oklahoma Panhandles. Stubble mulching on wheatlands is a common practice in this area and has proved its value during the present emergency. Many of these wheat farmers had not even used emergency tillage as of April 1, because it was not needed.

Emergency tillage with chisel or lister, to roughen the ground surface, has been a common practice in the severely blowing areas. In some instances this has been temporarily effective. But the best estimates indicate that at least 50 percent of the emergency tillage has stopped soil blowing only for a few days or a few hours. Many fields were tilled two or three times between February 19 and April 1. Repeated emergency tillage on many fields has now exhausted most soil moisture and pulverized the soil so that further tillage will do little or no good until good rains come.

Cross-hatched on the attached map are the areas where the most serious damage has taken place--in these areas 50 percent or more of the cropland has been damaged.

The damage has been greater in the two large areas, cross-hatched, largely because of the great amount of land not suited for cultivation that has been placed in cultivation since 1941. It is estimated that in the northern area more than 2 million new acres were broken out of grass and put in wheat in the last 12 years. At least 75 percent of this acreage was light sandy soil or shallow hard land that should never have been plowed. In the southern area at least 1 1/2 million acres were broken out of grass and put in cotton--nearly all (90 to 95 percent) of this new cultivated land is sandy and unsuited for cultivation.

The high prices of cotton and wheat undoubtedly influenced the recent plow-up in the Southern Great Plains. However, it should be pointed out that most of the plow-up occurred when prices were above the support levels. About 70 percent of the plow-up occurred prior to the 1949 crop year.

Rangeland Damage

Most damaged rangeland is that which is interspersed with cropland, except in some very sandy range areas.

Greatest rangeland damage is from deposition from adjacent croplands. Heavy depositions kill the remaining grass and often result in the deposited material blowing away and the blowing extending down into the original soil.

Most hardland ranges have adequate cover to prevent soil removal unless deposition first smothers the grass. Only the greatly misused ranges have such poor cover as to permit soil blowing to start there.

Sandy land ranges are more susceptible to blowing but are blowing severely mainly on ranges that have been overused.

Up to now drought has not been the major factor in causing ranges to blow - failure to adjust livestock numbers to forage production has been the main cause. Drought has decreased forage supplies on most ranches, but where live-stock numbers were adjusted to forage supplies promptly there is still sufficient cover to prevent erosion.

This could very well be the critical year for rangelands. Ground cover is rapidly deteriorating. Continued drought and grazing could cause wind erosion to spread rapidly on rangelands.

Effectiveness of Conservation Programs

The conservation work that has been done in the Southern Plains following the dust bowl of the thirties' has been very effective. If such conservation work had not been done the situation would be much worse at present. In fact, a serious dust bowl would probably have developed in 1953 except for previous and current conservation work.

For example, soil conservation district cooperators have fared relatively much better than farmers and ranchers who have not practiced conservation. There are fewer acres of land not suited for cultivation now in cultivation on these farms. Many of these cooperators have converted substantial amounts of former cropland to grassland. Water conservation practices, such as level terraces and contour tillage, have helped prevent runoff and saved water for crop use. Stubble mulch tillage is a common practice. Some conservation ranchers have not only kept their land from blowing but have produced enough forage on their ranges to tide their cattle herds through the emergency.

A comparison of the map of the dust bowl of the 1930's (attached to the appendix of this report) with the map that shows present conditions points up the fact that some of the worst blow areas of 20 years ago, in the Texas and Oklahoma Panhandles, are now not critically affected. A recent survey of these areas indicates that their relatively stable conditions is due mainly to the widespread use of conservation measures, especially to the revegetation with grass of eroding areas, better crop residue management by stubble mulching, and more extensive use of sorghums as feed crops, cash crops, cover crops, or strip crops.

Soil conservation district supervisors have assisted in organizing the emergency tillage program and in preparing for emergency cover as soon as sufficient moisture falls to grow cover crops. Many districts have made district-owned equipment available to cooperating farmers for emergency tillage and cover crop planting.

A CONSERVATION PROGRAM FOR SOUTHERN GREAT PLAINS

The soil and water conservation program that has been underway in the Southern Great Plains since the middle thirties' is technically sound. The conservation program devised by the Soil Conservation Service, the Land Grant Colleges, and other cooperating agencies for the old dust bowl, proved to be effective at that time. With a few modifications, to meet changing technology, essentially the same program is still being advocated by the SCS. If it can be fully applied to most of the land of the region, the SCS feels that this program can and will be the means of maintaining a sound and stable agriculture in this region.

But application of the long-range conservation program must be speeded up. Too many farmers and ranchers, many of whom are new-comers to the region, have not been following the program advocated. Today we have another acute emergency in the area. In addition to a speed-up of the long-range program, a temporary emergency program is now needed to help stabilize the land and the economy of the region until long-range conservation measures can become effective.

The conservation program advocated by the Soil Conservation Service and outlined on the following pages is divided into two main parts: (1) a temporary emergency program, and (2) a long-range soil, water, and plant conservation program. In addition, research and educational needs are discussed briefly.

Temporary Emergency Program

By April 1, emergency tillage measures had been applied to approximately 5,282,000 acres in the region. Such tillage has been effective in achieving varying degrees of temporary stabilization. The major portion of this work was accomplished by farmers and ranchers on their own initiative. The ACP provided financial assistance for this work in some counties. Technical guidance and assistance was furnished by the Soil Conservation Service in all states. Soil conservation districts assisted in formulating and carrying out the emergency programs.

Various types of credit are available through the State for emergency control measures, in New Mexico, Kansas and Colorado. Kansas and Colorado have State soil drifting laws which make it mandatory that landowners give emergency treatment to land which is blowing. Texas has a wind erosion law that may be placed in effect by counties. It is administered by a Commissioners Court. At present this law is effective in 9 counties and is available to all counties. The law provides for emergency treatment of land, the cost of which is assessed against the land.

Emergency Tillage

It should be noted that an emergency tillage program can, at the best, provide only temporary relief. It should be restricted to cropland where clods or moist heavy soil can be brought to the surface. Tillage treatment should be applied only when there is an emergency, and should not take the place of normal farming operations. Furthermore, emergency tillage should be used only as a preliminary step to establishing emergency cover.

The recommended sequence of emergency tillage operations is as follows:

1. Wide spaced chiseling or listing.
2. Chiseling or listing intervening spaces between previous furrows.
3. Chiseling or listing in above order may be continued until all the field is tilled. Then tillage in a different direction may be applied.

Establishing emergency cover.

Emergency cover of some kind should be established at the first opportunity on blowing fields, that is, as soon as enough precipitation comes to permit the growing of cover crops. If the opportunity does not come to plant a crop, the existing weed cover should be managed so as to provide the maximum protection to the land.

The principal emergency cover crops adapted to the region are sorghums, including broom-corn and Sudan grass, and millet.

Recommendations as to how Department's programs may aid the Emergency Program.

1. Acreage allotments, price support, and crop insurance programs should not limit or restrict the planting and maintenance of emergency cover crops.
2. Financial assistance for emergency treatment of land should be in accordance with approved technical recommendations agreed to by all appropriate state and federal agricultural agencies.
3. Conservation materials and services needed in the emergency program should be considered for inclusion in the ACP cost-sharing program.

4. The emergency program should be so operated as to constitute a logical first step in making the needed long-time program adjustments. Insofar as practicable, financial assistance, including credit furnished for emergency treatment, should be conditioned on the use of the land being pointed toward a technically sound system.

5. In designated wind erosion areas in need of emergency control farmers should be allowed to plant emergency cover crops without affecting any future acreage base.

Long-Range Soil and Water Conservation Program

There is an urgent need for applying more speedily a long-range soil and water conservation program based on physical facts and sound economic principles that will reduce the wind erosion hazard to a minimum and result in a stable agricultural economy for the region.

The Physical Aspects of a Long Range Program.

Land use within the area should be based upon the Departmental objective of using each acre within its capabilities and treating it according to its needs for protection and improvement. To meet this objective further determinations must be made as to which land is suitable for permanent cultivation and which should remain in native cover.

Soil surveys and other physical inventories basic to this determination should be completed within the next two years in sufficient detail to set forth the basic capabilities of the land, with first priority on surveys given to land now in cultivation.

A. Cropland Program

1. Only the soils possessing the proper topography, slope, depth, and texture and lying within a rainfall area that will support cultivated crops should be placed in or kept in cultivation. Before new land is broken for cultivation, its capability should be determined, and it should not be placed in cultivation if it does not fall within an arable class.

2. More encouragement should be given to the use of kinds and varieties of crops known to be adapted to the local soils and climatic conditions. These crops should be used in proper combinations and patterns and managed in a way which will give protection to the topsoil from wind and water erosion the year-round by providing, as near as possible, a continuous cover of growing plants or crop residues.

The cropping systems should include a high percentage of heavy residue producing crops on the drylands and cover crops or combination cover and green manure crops on irrigated farm lands and, where adapted, on dry-farm lands.

3. Any cropping system should include feed crops (for example, sorghums on dry-farm lands and alfalfa on irrigated lands) before the principle of a continuous soil cover can be realized. Compatible with such a system is the storing of a reserve of feed crops in the stack or in the silo. Not only will a reserve feed supply be of tremendous value in taking pressure off the grazing lands during a succession of drouthy years, it will relieve grazing pressure on growing wheat crops and sorghum stubble, the overgrazing of which often is a major factor in wind erosion.

4. It should be realized that during a succession of extreme drouthy years residues will virtually disappear, especially on the dry-farm lands, and it will be necessary to provide for emergency tillage in keeping with recommendations for the temporary emergency program.

5. It is likely that some system of crop allotment will be necessary in the future, as it is at the present time. Such a program should provide the opportunity for a farmer to use the diverted acres for annual pasture crops to provide a soil cover (examples are wheat, sweet sorghum, and sudan grass), and for the growing of residue crops specifically for cover. Overgrazing of such cover crops is dangerous and should be regulated so as to leave sufficient cover for protection of the soil against blowing.

6. In this region, most of the water for irrigation comes from wells. The supply is limited and is not inexhaustible. Much of this water is now being wasted through unwise and excessive irrigation. Water should be applied in accordance with the requirements of the irrigated plants for maximum production.

7. Cultivation methods such as delayed stubble mulching should be encouraged as a method of preserving crop residues as soil cover and to assist in physically conditioning the soil for resistance against the forces of wind and water, and to increase the infiltration rate of water into the soil. This principle of cultivation is very important to proper plant, soil and moisture relationships.

8. Structural water conservation practices such as terracing should be recommended and encouraged where they are applicable to the existing soil and climatic conditions.

9. Vegetative and structural water disposal systems should be encouraged where necessary to control damage from excessive runoff. Particular emphasis should be given to the vegetative phases of waterway treatment.

10. Attention should be given also to making the farm a place of beauty, enjoyment and pride. Such things as farmstead windbreaks, fish ponds and the creation of farm wildlife habitats should be encouraged as desirable parts of farm programs.

B. Range Land Program.

Lands not suited for cultivation but which are now cultivated should be restored to a permanent grass cover as soon as possible. In this revegetation program maximum use should be made of grass and forage species that have demonstrated their adaptability for long time survival and high level forage production under Southern Great Plains conditions.

The objective of a long range program for the use and management of permanent grasslands is to restore or maintain climax or near climax plant cover on the various range sites found within the area. Judicious management of this kind of plant cover will assure protection from wind and water erosion and maintain high level forage production.

Forage production on rangelands fluctuates greatly in response to variable moisture supplies. Adjustments in the degree of grazing based upon annual forage production are essential in maintaining satisfactory range conditions.

Additional factors needing careful consideration in obtaining the degree of grazing use that will restore or maintain satisfactory range conditions and high level forage production include:

1. Adequacy of ranch improvements and livestock handling facilities such as livestock water and fences to secure proper degree of grazing use.

2. The need for and feasibility of supplement range improvement practices such as water spreading, gully control, brush eradication, and reseeding depleted range lands to speed up range recovery.

3. The judicious use of supplemental feeds as needed to assure adequate levels of livestock nutrition.

Speeding-up Establishment of the Long-range Program.

Certain economic and social factors must be taken into account in devising methods whereby the long-range conservation program may be speeded-up to the degree that seems necessary. There are several changes or adjustments that need to be made before a stabilized agriculture can operate in this area. It is recognized that some of these changes will have to be brought about gradually and over a period of years, but others may be made quickly.

Some of the changes most urgently needed at present are as follows:

1. Land ownership patterns must be changed in some areas to permit using land within its capabilities and also permit an adequate standard of living for those operating the land. These adjustments should be made as soon as possible since nature will accomplish this eventually and in so doing will seriously impair the productive capacity of the land.

Adjustments in land ownership patterns should be made on the basis of a careful study of needs and benefits of all individuals, groups and agencies involved. Any future Federal aid in making needed ownership and land use adjustments should be directed toward helping the present owners and operators insofar as practicable.

2. Many of the present farm programs of the Department were devised mainly for areas with well established farming systems and reasonably stable climatic and physical land conditions. Some of these programs do not fit too well in this area that is subject to periodic droughts of long duration.

Adjustments in the operations of some Federal programs seem to be needed as a means of encouraging land use changes and improved cropping systems. It is recommended that some of these programs be studied to determine the desirability of certain changes or modifications for this particular region.

Program features needing study include the following:

a. Wheat and cotton acreage allotments are presently being made on the basis of historical data. Since one-crop farming (wheat or cotton) is the rule in most of this region, land owners and operators tend to keep a maximum of land in cultivation in order to maintain a high acreage allotment. Studies should be made to determine how these allotments

can be made on a permanent base in accordance with land capabilities. These changes cannot be made rapidly. Possibly the best beginning would be to try this idea of a permanent allotment base in pilot areas. Evidence indicates there are counties or States where interest is high enough to warrant their selection as pilot areas to test this method.

b. At present, it appears that cost sharing through ACP tends to encourage the continued use for cultivation of Class VI and VII land. *(See Footnote). Such cost sharing should be redirected to such practices as the establishment and maintenance of permanent vegetation on land not suited to cultivation.

c. Federal crop insurance can now be secured, at least in some parts of the area, on Class VI and VII land. Should not this be adjusted to permit crop insurance only on land suitable for cultivation?

d. Favorable prices have encouraged the plow-up of some sod land not suited to cultivation. Perhaps the impact of price supports should be studied to see if they should be limited to crops grown on land suitable for cultivation.

e. Certain kinds of federal and private loans and credit are being made to land owners and operators for growing cash crops, such as cotton and wheat, without determination as to whether the land is suited for cultivation. Should Federal and private production loans be made where the repayment of the loans plus interest is based on cash crops produced on lands unsuited to cultivation?

In addition to the suggested changes mentioned above, the following points should be kept in mind in developing and speeding up the long-range conservation program.

1. Probably the Soil Conservation Service should increase the amount of technical assistance to soil conservation districts in this region for the duration of the emergency, and consider increasing such assistance until the long-range objectives have been largely achieved. Undoubtedly, on-site technical assistance is sorely needed by many farmers during the present emergency. And such assistance will be needed in making most desirable long-range adjustments, especially in land classification and changes of land use.

2. There may be a need for further State financial aid to soil conservation district operations, especially during the present emergency.

*Land Use Capability Class VI and VII lands are not suitable for cultivation under the hazards of physical and climatic circumstances of the area.

3. Whenever local people recommend the adoption of land-use ordinances, such ordinances should be in accordance with the objectives of the long-range program for the region.

4. If any Federal land purchase program is ever undertaken it should be directed toward re-grouping the land into economic units that will permit and encourage use of all land within its capabilities and the selling the land back to private ownership. Federal land purchase is recommended only as a last resort.

Research Needs

The maintenance of land cover throughout the year is the key to wind erosion control in this region.

To help accomplish this objective promptly, research efforts should be intensified to develop additional information on the following:

1. Amount of cover needed for effective erosion control for each climate-soil complex.

2. Farming and tillage methods that will maintain adequate residue on the surface of sandy lands.

3. Tillage, crop, fertility and conservation practices that will make maximum use of precipitation and soil moisture for crop production.

4. Row spacing and stands of sorghums that give maximum protection and yields.

5. Correct management of crop residues on irrigated lands for wind erosion control and maintenance of soil structure.

Related information needed:

1. Crops, crop rotations, or sequences that will maintain or improve soils.

(a) Species of grass to use in grass-crop rotations (with emphasis on ease of establishment).

(b) Length of rotation needed (including years in grass).

- (c) Desirability of legumes in grass mixtures or in rotations.
- (d) Effect of various crops on soil properties (physical and chemical condition) and water intake.

2. Further study and analysis of present land capability classifications to determine their correctness with respect to economic, climatic and technological conditions (particularly needed in marginal zones).

3. Further study of size of unit, land and tenure pattern, landlord-tenant arrangements, and other human relationship factors that may be beneficial to soil conservation in the Southern Plains agriculture.

4. An analysis of climatic factors to improve the general understanding and knowledge of the hazards of farming and ranching on the Plains, thus focusing attention on the best adapted systems of conservation agriculture for the region.

For range conservation which will maintain satisfactory cover, additional information is needed on:

1. Returns from grazing range lands maintained in varying range conditions.

2. Information on returns obtainable from grassland agriculture in comparison to cultivated use on different classes of land.

3. Grass species and seeding methods in the more arid portions of the Plains.

4. Economical methods for the control of undesirable plants on range lands.

Educational Program

The Department should cooperate with the State Land-Grant Colleges, southern Great Plains Council and all information media in carrying out an intensified education and information program in this region until conditions improve greatly.

The objective of such an educational and information program would be to bring about a widespread understanding of the problems and the program needed for the Southern Great Plains.

Long range benefits to all people living in the region should be the principal theme of all educational and informational work. It should be stressed that such benefits can be achieved only through wise use and treatment of the land.

Although approaches to different groups necessarily vary in the education and information program, the objectives are the same for all groups.

Among the groups where such informational and educational work is urgently needed, are the following:

1. Local, State, and Federal Government Agencies.
2. Local soil conservation district leaders.
3. Farmers, ranchers, farm leaders, land owners, and farm organizations.
4. Civic groups, news agencies, industrialists, bankers, business and professional men, and other groups or individuals that may influence public opinion.

Also, it is highly desirable that the general public, both within the region and outside it, understand the problems and needed program.

In order to achieve the objectives of such an educational and information program the Department must:

1. Have specific and convincing information about land damage and land needs.
2. Have a clear-cut program that will alleviate land damage and benefit the people of the region.
3. Present the same basic information, with local adaptations, to all groups in all sections.
4. Cooperate closely with all agencies or groups concerned with this problem, including all groups mentioned above; and get the active participation of most of these groups in the educational program.

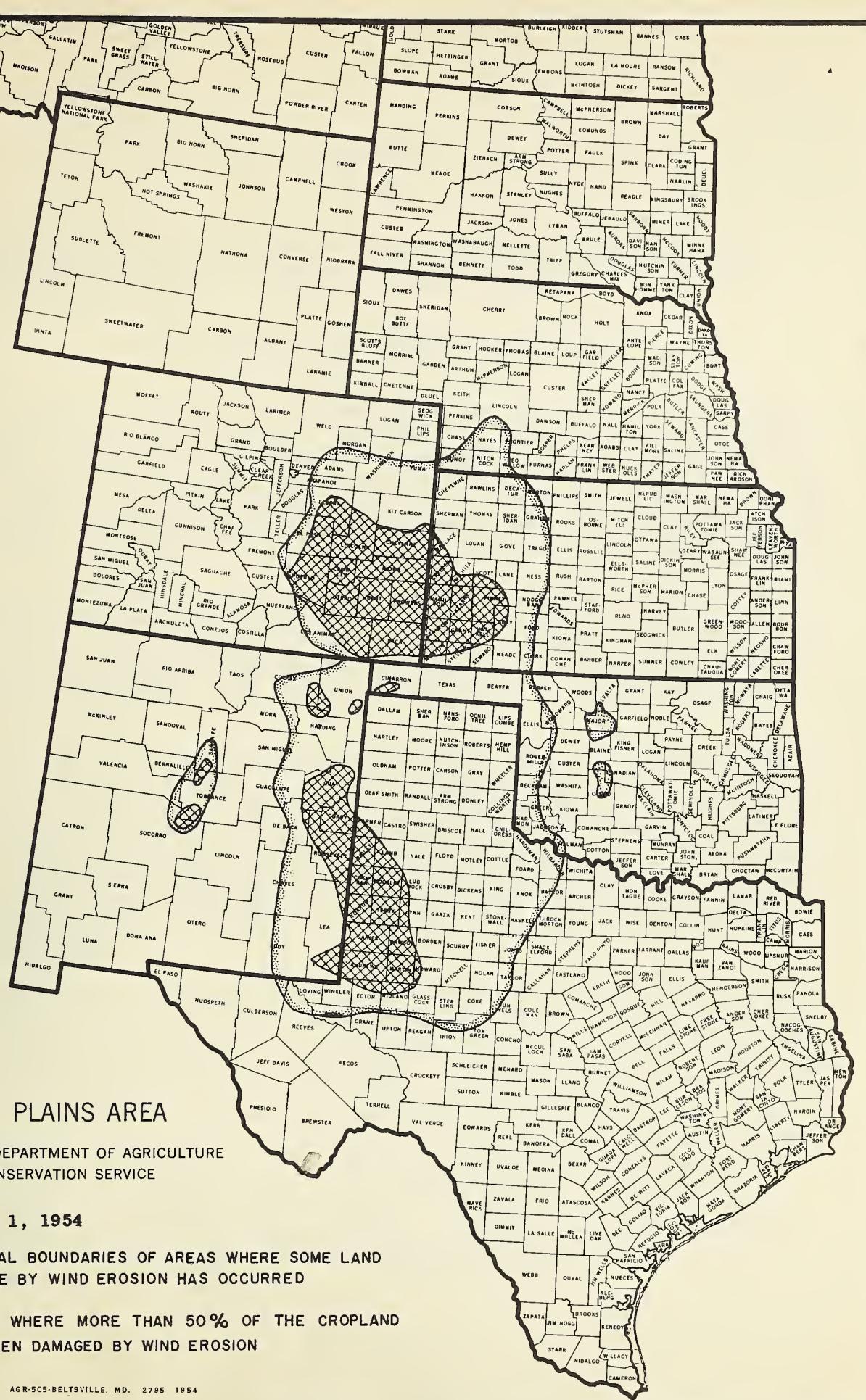
TABLE 1.--Land Damage in the Southern Great Plains

April 1, 1954

State	Damaged Land		Range Land		Liable To Be Damaged	
	Cropland Acres	(2) Percent	Acres	(2) Percent	Acres	Range Land
Kansas	3,080,000	30	960,000	20	3,550,000	890,000
Colorado	3,250,000	50	960,000	20	1,250,000	860,000
Texas	3,290,000	25	1,770,000	5	2,380,000	3,650,000
New Mexico	1,270,000	60	1,500,000	30	870,000	1,250,000
Oklahoma	660,000	10	20,000	2	120,000	10,000
TOTAL	11,650,000	30	5,210,000	10	8,170,000	6,660,000

(1) Damaged land is defined as any land, cropland or rangeland that has been currently affected by wind erosion which may or may not immediately lower yields but will subject land to further erosion hazards and subsequently adversely affect the inherent productive capacity. It is described as - cropland with surface soil removal, surface swept smooth, depressions leveled, and hummocks and fence row drifts forming; - and, rangeland with soil removal, plant crowns exposed, hummocks and fence row drifts forming, and deposition covering vegetation.

(2) Percent of total acres in crops or range within the area subject to damage by wind erosion.



APPENDIX

to the

Report of the Soil Conservation Service to the Secretary of Agriculture on Problems of the Southern Great Plains and a Conservation Program for the Region.

A Brief History of Drought and Land Use
in the Southern Great Plains

The first extensive settlement of the Southern Great Plains by farmers was from 1887 to 1891. It began the year after the great blizzard of 1886 killed off many of the cattle of the big ranchers and it gained momentum until the drought of 1890 to 1895 turned the tide. During this period, most of western Kansas was partially settled by homesteaders and many homesteads were settled in eastern Colorado and the Texas Panhandle.

The movement of settlers was mostly eastward from 1892 to 1895, especially in Kansas and Colorado, because of the 5-year drought that started in 1890, the grasshopper plague of 1892, and the panic of 1893 to 1895. Many counties of western Kansas had less than half the population in 1895 than they had in 1890.

Most of the southern Plains had good rains in 1896 and 1898, however, and resettlement was in full swing again by 1899. Settlement continued at an accelerated rate for more than a decade. By 1910, practically all of western Kansas, except a few strongholds of the cattlemen, was settled. Also, most of the Texas and Oklahoma Panhandles were partially settled by that time. Eastern Colorado was well settled and many homesteaders had poured across the Texas line into eastern New Mexico.

Most of the southern Plains had a severe drought from 1910 to 1914; although some localities reported good rainfall for some of these years. During this drought, a small dust bowl started in Thomas county Kansas. From 1912 to 1914 more than 65,000 acres in that county blew severely--probably as bad as any similar sized area is now blowing. At that time, much of Thomas county had been plowed for cultivation, with corn as the principal crop. This small dust bowl should have shown farmers of the area what they might expect in case of a general and protracted drought. In fact, it did influence future farming in Thomas county, because this county blew less than some surrounding counties during the dust bowl years of the thirties.

Thomas county, Kansas, was not the only area of the Plains which had soil blowing prior to 1930. Some soil blowing occurred during drought years in most localities throughout the Plains. Some fields blew almost every year. But, in general, the blowing was confined to small areas or isolated fields and was not a region-wide problem.

Above normal moisture conditions prevailed generally over most of the Plains from 1914 to 1931. There were a few dry years (1917-18 was the worst drought) and many local droughts, but no general drought over the region that lasted more than two years. During this period, settlement of the Plains was largely completed. And it was during this period that much of the sodland was broken out for wheat.

High prices and patriotic appeals for more wheat started the plow-up soon after World War I broke out. During the latter years of war the farm tractor came into general use over the Plains and helped to accelerate the plow-up. But, the big plow-up did not really get well under way until the middle twenties.

Wheat farmers of the Plains began to use combines extensively in 1922 and 1923. Combines and tractors spread rapidly for the next 8 or 10 years and the acreage of wheat increased in proportion. The tractors and combines also introduced the "suitcase farmer."

Between 1925 and 1931 the wheat acreage of the southern Plains was increased by more than 200 percent. In many counties it was increased by 400 to 1000 percent. Cotton, also, became an important crop in west central Texas during this period. Hundreds of thousands of acres of sod were plowed to plant cotton. The all-purpose tractor with two and three row attachments for planting and cultivating row crops helped to bring this about.

Low prices of 1930 and 1931 did not stop the plow-up. The plow-up was checked only after 2 or 3 years of drought, in 1934.

The long drought that helped cause the dust bowl of the 1930's began in the summer of 1931. Heavy local rains occurred at times and a few communities had above-normal precipitation some years, but in general the precipitation was below normal for 7 years following the summer and fall drought of 1931. The wheat crop was spotty in the summer of 1932. In 1933 there was a short crop over most of the region. That fall, however, there was little decrease in wheat acreage planted--most farmers planted their wheat in the dust and hoped for snow or rain. A few even plowed up more sod in order to increase their wheat acreage--hoping to recoup some of their losses.

Some of the lighter soils blew severely in the spring of 1932; but most dust storms were local and confined largely to the sandy lands that had been planted to corn and cotton or to wheatlands where crop failure left the ground bare. Dust storms were more frequent and spread over a wider area in 1933; but those who lived on the Plains were still more concerned about crop failures and low prices than they were about wind erosion. It was not until the spring of 1934 that plainsmen and the rest of the nation became seriously alarmed about what was happening to the land.

The Dust Bowl - 1934 to 1938

April 14, 1934 is considered the birthday of the old "dust bowl" by those who desire to pin its beginning down to a definite date. That is the day that the first big "black roller" rolled down from western Kansas across the Oklahoma and Texas Panhandles. That wasn't the last "black roller," by any means, but it is the one best remembered by those who lived there because it was the first dust storm that literally "blacked out" the sun in mid afternoon.

Dust continued to blow in most localities through the rest of April and into May. But most of the blowing was local in nature. The topsoil just shifted back and forth between neighboring fields and the dust that sifted into the houses merely caused inconveniences. But on May 10, 1934, there was another dust storm that made history. This time the wind came out of the West. It did not roll up a huge bank of dirt in front of it as had the April 14 storm. But it did pick up topsoil from almost every bare field from New Mexico to Montana. The wind currents were such that the fine topsoil was carried to the upper atmosphere. Dust was carried east for hundreds and thousands of miles. Communities in the Mississippi valley and eastern United States received a blanket of dust on May 11 and 12 during dead calms. This is the storm that blanketed Washington, D. C., New York City, and even some ships in the North Atlantic with dust.

Nineteen hundred and thirty-five, 1936, and 1937 were all dry years over most of the Plains. Crop failure was common. Dust continued to blow. The number of dust storms, in most communities, increased each year from 1934 to 1938. The acreage that was blowing also increased. These things happened in spite of the fact that some farmers were bringing fields under control through the use of soil and water conservation measures.

During the summer of 1938 good rains fell over most of the Plains. These rains enabled farmers to plant and grow cover crops on much of the blowing land; and they brought up a cover of weeds on many abandoned fields. The summer and fall rains of 1938 also enabled many farmers to make a fair wheat crop in 1939.

Nineteen hundred and thirty-nine was another dry year over most of the Plains, but summer and fall rains of 1940 enabled farmers to heal over most trouble spots of the dust bowl. A good wheat crop was made in 1941 and that year turned out to be the wettest in the history of the Plains. Newspapers in the "Dust Bowl" began to call it the "Mud Bowl." From 1941 to the summer of 1950 most areas of the Great Plains had above normal rainfall, though local droughts occurred.

Good Times Return to the Plains

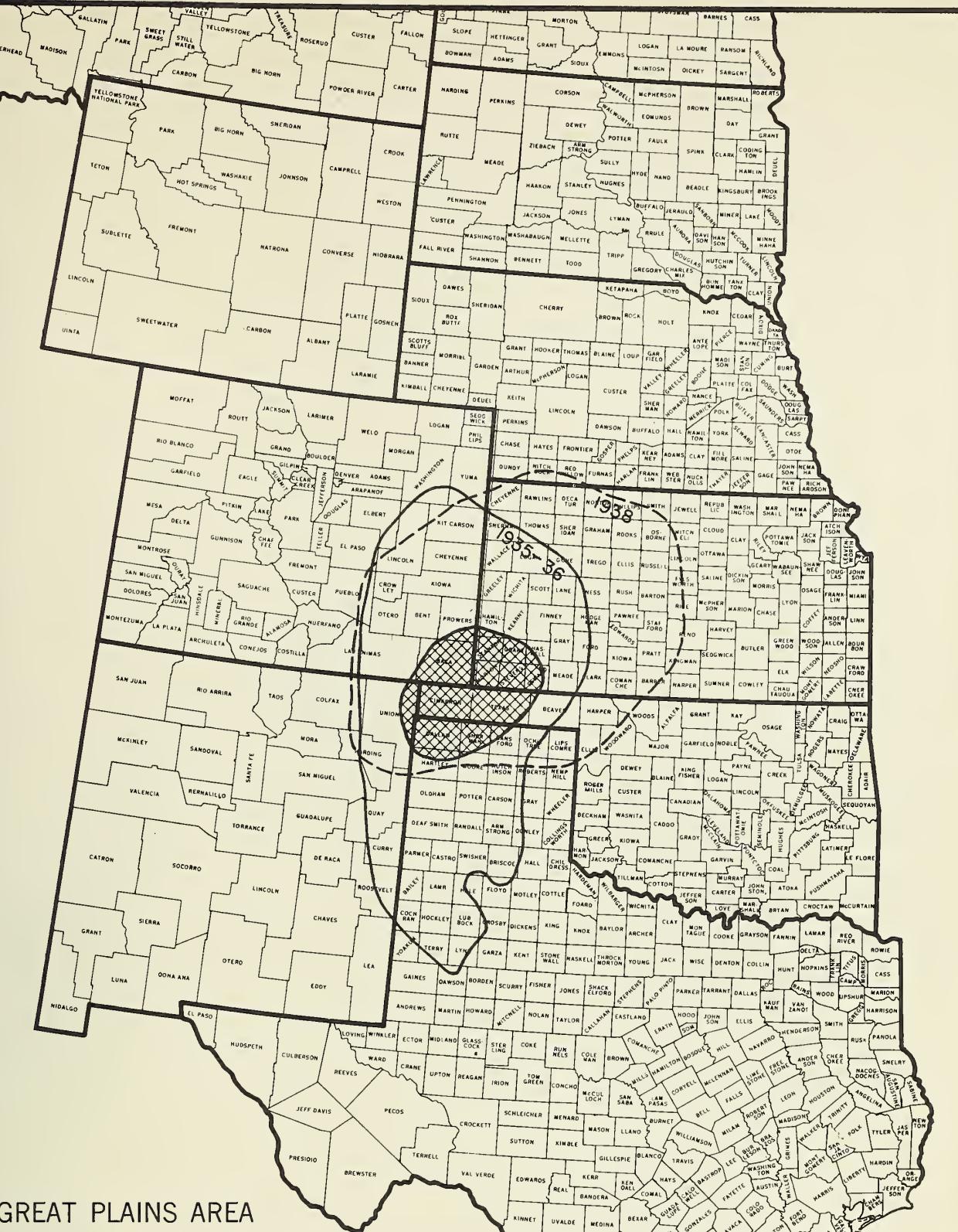
During the decade, 1941 to 1950, most farmers and ranchers of the Plains had a very prosperous period. Bumper crops were the rule and prices were high. Land values soared; land that had been offered for sale at \$3 to \$4 per acre, without takers, in the 1930's brought \$40 to \$60 per acre during the 1940's. There were many local dust storms during this decade, and a few dusters that covered large areas. But, with a few exceptions, land damage was confined to scattered fields.

One of the chief exceptions was the sandy land south and west of Lubbock, Texas. By 1947, sand storms were common in this area, which was planted largely to cotton. These sand storms received little attention, nationally. But they were severe in many localities, and damage to the land was great on many fields.

During the 10 year period, 1941-1950, there was another big plow-up of sodland on the southern Plains. It did not compare to that of the 20s'. But it was extensive in some sections. Most of it was on the western fringes of the old "dust bowl." The two principal areas in which this plow-up occurred were: (1) eastern Colorado, where sodland was plowed mainly for wheat production, and (2) west central Texas and eastern New Mexico, where sodland was plowed mainly for cotton.

Altogether, about 4 million acres of sodland were plowed up for wheat or cotton during the decade. Since most of the land that was really suitable for cultivation, and some that was not, had been plowed prior to 1934, the greater part of this newly plowed land was not suitable for permanent cultivation. At least 75 percent of this newly plowed land is unfit for cultivation. It will produce profitable crops only during years of above normal rainfall. It is highly susceptible to wind erosion in years of below normal rainfall.

The drought that started in 1950-51 did not stop the plow-up of sodland, but did check it. The amounts of sod breaking decreased each year from 1949 through 1952 and such breaking had almost ceased by 1953, though a few fields were plowed that year.



GREAT PLAINS AREA

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

GENERAL BOUNDARY OF AREA SUBJECT TO
SEVERE WIND EROSION IN 1935-36.

GENERAL BOUNDARY OF AREA SUBJECT TO
SEVERE WIND EROSION IN 1938.

AREA IN WHICH MOST SEVERE WIND
EROSION OCCURRED, 1935 TO 1938.



